consumption of shells by the button factories was from 10 to 12 thousand tons—to-day the consumption of a normal year will exceed 100 thousand tons. The State of Iowa has seen how necessary it was to do something to insure the raw product for the button factories. To this end through their Congressmen they got the Federal Congress at Washington to appropriate money for the protection of the mussel. With this money they have established at Fairport, Iowa, a mussel hatchery, where they are experimenting and trying to raise the mussel in ponds. They realize the necessity of producing the shells.

Instead of working the mussel beds until we are forced to hatch, cultivate and raise them, why not protect the wild beds that we have, and harvest the crop that they produce annually?

There is no doubt but this is the better way; and Kentucky has in its boundary the major portion of the Ohio river with 90 miles of shell beds. Protect them and save this raw product for the button industry. It is valuable to Kentucky and to the whole world. This is the right way—take the lead, and the other states will follow.

FRESH-WATER MOLLUSCA LIVING OUT OF THE WATER.

BY V. STERKI.

Aplexa hypnorum (L.) and *Sphærium occidentale* Pme. are well known examples of mollusks living at places where water stands only during part of the year, often for short periods in spring, and occasionally after heavy rains. The last named species appears to be especially well adapted to that kind of habitat, and even recently discharged young mussels have often been found living on apparently quite dry soil under a thin layer of dead leaves. It is also known that small *Lymnæa*, and *Pomatiopsis* are ofter found crawling out of water.

Fresh-water mollusks of almost all groups bury themselves in the soil, with the disappearance of surface water, and survive for shorter or longer periods. But quite a number of pulmonates and branchiates appear to remain not only alive but active and propagating for long periods or permanently. How much this fact has to do with

the evolution of terrestrial life from aquatic, and what physiological, and eventually anatomical and embryonic changes are involved, must be left to the scientists.

The following observations may be worthy of notice in this connexion.—In low woods, north of Geneva, Ohio, *Segmentina armigera* (Say) were found alive in company with *Sphær. occidentale*, and in the same woods *Physa gyrina* were found, then mostly dead shells, where they could not have been transported from any permanent body of water.

In damp woods at Kenmore, Summit Co., Ohio, among patches of various terrestrial mosses, a few dozen *Amnicola limosa* Say (*A. parva?*), living and of various ages, were found (late August), and with them a few puerile *Physa* apparently *sayi* Tappan. No water was standing in the woods, even after heavy rains, and moreover these snails or their parents must have survived e. g. the exceptionally hot and dry summer of 1911.

In July of that summer, in a marsh near Hudson, Ohio, which had been dry as a bone for weeks, like hundreds of others, Dr. Rush and I found several dozen specimens of *Lymnæa* apparently *lanceata* Gld., living and in good condition, clinging to stems and leaves of sedges (*Carex* and *Scirpus*), several inches above the ground. There is hardly a doubt that they had been gathering all the moisture they could from dew at night.

In woods of that vicinity we found *Pisidium abidtum subrotundum*, typical, full-grown to young, under dead leaves in a damp spot. Other *Pisidia* have been found at similar places, and also in swamps among mosses, out of water, and even on steep banks where water could never be standing.

Small *Lymnæa*, apparently *parva* Lea, are often found in greenhouses, on mossy flowerpots, sometimes in large numbers, evidently doing well and propagating.

Similar observations have doubtless been made by other malacologists.